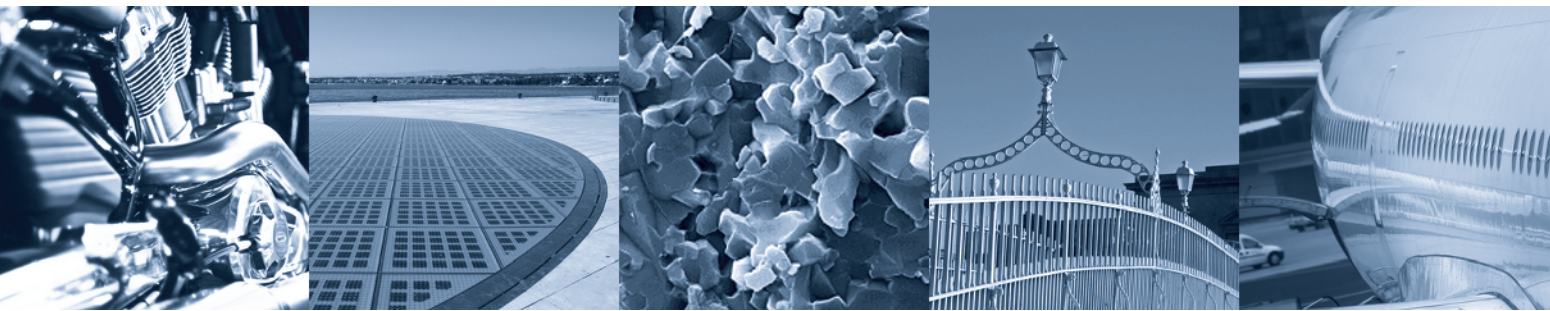




Volume 53  
Issue 2  
February 2012  
Pages 65-112

Published since 1978  
formerly as Archives of Materials Science  
or Archiwum Nauki o Materiałach (in Polish)

# Archives of Materials Science and Engineering



**Editor-in-Chief Prof. Leszek A. Dobrzański**

International Scientific Journal published monthly  
by the World Academy of Materials  
and Manufacturing Engineering

<http://www.archivesmse.org>



PUBLISHED SINCE 1978 – formerly as Archives of Materials Science or Archiwum Nauki o Materiałach (in Polish)

### Editor-in-Chief

**Prof. Leszek A. Dobrzański** – Gliwice, POLAND

### Editorial Council

#### DEPUTIES EDITOR-IN-CHIEF

**Prof. Gilmar Batalha** – Sao Paulo, BRASIL  
**Prof. Nikolaos Gouskos** – Athens, GREECE  
**Prof. Toshio Haga** – Osaka, JAPAN  
**Prof. Abdel Magid Hamouda** – Doha, QATAR  
**Prof. Mark J. Jackson** – Worcester, USA  
**Prof. Thomas Neitzert** – Auckland, NEW ZELAND  
**Prof. Jerzy Nowacki** – Szczecin, POLAND  
**Prof. Ming-Jen Tan** – Singapore, SINGAPORE

### Associate Editors Team

#### PRODUCTION EDITOR

**Ms Marzena Kraszewska, MA** – Gliwice, POLAND

#### TEAM SECRETARY

**Dr Małgorzata Dziekońska** – Gliwice, POLAND

#### THEMATIC AREA EDITORS

**Dr Mirosław Bonek** – Gliwice, POLAND  
**Dr Klaudiusz Gołombek** – Gliwice, POLAND  
**Dr Magdalena Polok-Rubiniec** – Gliwice, POLAND  
**Dr Anna Włodarczyk-Fligier** – Gliwice, POLAND  
**Dr Bogusław Ziębowicz** – Gliwice, POLAND

#### STATISTICAL EDITOR

**Dr Daniel Pakuła** – Gliwice, POLAND

#### LANGUAGE EDITOR

**Dr Janusz Madejski** – Gliwice, POLAND

### Editorial Assistance

**Ms Justyna Hajduczek, MSc** – Gliwice, POLAND  
**Mr Paweł Jarka, MSc** – Gliwice, POLAND  
**Ms Magdalena Kałużna, MSc** – Gliwice, POLAND  
**Ms Małgorzata Ondrula, MSc** – Gliwice, POLAND

### Reading Direct Editors

**Mr Adam Jagiełło, MSc** – Gliwice, POLAND  
**Mr Piotr Zarychta, MSc** – Gliwice, POLAND

### Editorial Key Reviewers Committee

**Prof. Dorel Banabic** – Cluj Napoca, ROMANIA  
**Prof. Tadeusz Bold** – Gliwice, POLAND  
**Prof. Tara Chandra** – Wollongong, AUSTRALIA  
**Prof. Antonio Cunha** – Guimaraes, PORTUGAL  
**Prof. Jan Cwajna** – Katowice, POLAND  
**Prof. Edward D. Doyle** – Swinburne, AUSTRALIA  
**Prof. Georgiy Drapak** – Khmel'nitsky, UKRAINE  
**Prof. Jan Dutkiewicz** – Cracow, POLAND  
**Prof. Stuart Hampshire** – Limerick, IRELAND

**Prof. Adam Hernas** – Katowice, POLAND  
**Prof. Marek Hetmańczyk** – Katowice, POLAND  
**Prof. Hong Hocheng** – Hsinchu, TAIWAN  
**Prof. Werner Hufenbach** – Dresden, GERMANY  
**Prof. David Hui** – New Orleans, USA  
**Prof. Yong-Taek Im** – Daejeon, KOREA  
**Prof. Leopold Jeziorski Dr hc** – Czeszochowa, POLAND  
**Prof. Jan Kazior** – Cracow, POLAND  
**Prof. Albert Kneissl** – Leoben, AUSTRIA  
**Prof. Ivars Knets** – Riga, LATVIA  
**Prof. Janez Kopač Dr hc** – Ljubljana, SLOVENIA  
**Prof. Piotr Kula** – Lodz, POLAND  
**Prof. Krzysztof J. Kurzydłowski Dr hc** – Warsaw, POLAND  
**Prof. Karl Kuzman** – Ljubljana, SLOVENIA  
**Prof. Eugeniusz Łągiewka** – Katowice, POLAND  
**Prof. Bogusław Major** – Cracow, POLAND  
**Prof. Cemal Meran** – Denizli, TURKEY  
**Prof. Stanisław Mitura Dr hc** – Lodz, POLAND  
**Prof. Ryszard Nowosielski** – Gliwice, POLAND  
**Prof. Abraham Atta Ogwu** – Paisley, UK  
**Prof. Jerzy Pacyna** – Cracow, POLAND  
**Prof. Lucjan Pająk** – Katowice, POLAND  
**Prof. Peter Palček** – Zilina, SLOVAK REPUBLIC  
**Prof. Fusheng Pan** – Chongqing, CHINA  
**Prof. Jan Pilarczyk** – Gliwice, POLAND  
**Prof. Wojciech Przetakiewicz** – Warsaw, POLAND  
**Prof. Maria Richert** – Cracow, POLAND  
**Prof. Maria H. Robert** – Campinas, BRAZIL  
**Prof. Mario Rosso** – Turin, ITALY  
**Prof. Stanislav Rusz** – Ostrava, CZECH REPUBLIC  
**Prof. Yuriy Shalapko** – Khmel'nitsky, UKRAINE  
**Prof. Jan Sieniawski** – Rzeszow, POLAND  
**Prof. Paul Siffert** – Strassburg, FRANCE  
**Prof. Jorge A. Sikora** – Mar del Plata, ARGENTINA  
**Prof. Božo Smoljan** – Rijeka, CROATIA  
**Prof. Jerry Sokolowski** – Windsor, CANADA  
**Prof. Mirko Soković** – Ljubljana, SLOVENIA  
**Prof. Antonio Sousa** – Fredericton, CANADA  
**Prof. Jerzy Stobrawa** – Gliwice, POLAND  
**Prof. Vasco Teixeira** – Braga, PORTUGAL  
**Prof. Miklos Tisza** – Miskolc, HUNGARY  
**Prof. Boris Tomov Dr hc** – Rousse, BULGARIA  
**Prof. Jose M. Torralba Dr hc** – Madrid, SPAIN  
**Prof. Laszlo Toth** – Miskolc, HUNGARY  
**Prof. Algirdas V. Valiulis** – Vilnius, LITHUANIA  
**Prof. Tadeusz Wierzchoń** – Warsaw, POLAND  
**Prof. Abdalla Wifi** – Cairo, EGYPT  
**Prof. Władysław K. Włosiński Dr hc** – Warsaw, POLAND  
**Prof. Gwomei Wu** – Taoyuan, TAIWAN  
**Prof. Senay Yalcin** – Istanbul, TURKEY  
**Prof. Bekir Sam Yilbas** – Dhahran, SAUDI ARABIA  
**Prof. Andrzej Zieliński** – Gdansk, POLAND  
**Prof. Paweł Zięba** – Cracow, POLAND  
**Prof. Jozef Zrnik** – Pízen, CZECH REPUBLIC  
**Prof. Marian Żenkiewicz** – Bydgoszcz, POLAND  
**Prof. Marcel Žitňanský** – Bratislava, SLOVAK REPUBLIC

## Patronage



World Academy  
of Materials  
and Manufacturing  
Engineering



Association of  
Computational Materials  
Science and Surface  
Engineering



Polish Academy of  
Sciences, Committee  
of Materials Science,  
Section of Metallic  
Materials



Institute of Engineering  
Materials and  
Biomaterials of Silesian  
University of Technology,  
Gliwice, Poland

## Financial support

The efforts to achieve the financial support of the Journal in 2012 from the Ministry of Science and Higher Education in Poland have begun.

## Abstracting services

This Journal is sent to individual receivers from ca. 50 countries of the world and is delivered to the National Libraries and Universities and also to other scientific institutions in ca. 50 countries of the world. The electronic system of Reading Direct allows to access to the electronic version of that journal on-line, in the promotional period free of charge. This Journal is included in the reference list of the Polish Ministry of Science and Higher Education (9 points). The Journal is cited by Abstracting Services such as:



The procedure of its registration in the databases of Compendex, CiteSeer, GetCited, Web of science, Engineering Village, Public Knowledge Project, Edith Cowan University's Institutional Repository, Journals Online and Inspec has begun.

## Journal Registration

The Journal is registered by the 1<sup>st</sup> Civil Department of the District Court in Gliwice, Poland at number 278.

## Publisher



INTERNATIONAL  
**OCSCO**  
WORLD PRESS

International OCSCO World Press  
ul. S. Konarskiego 18a/366,  
44-100 Gliwice, Poland

e-mail: [info@archivesmse.org](mailto:info@archivesmse.org)

Bank account: Stowarzyszenie Komputerowej Nauki o Materiałach i Inżynierii Powierzchni

Bank name: ING Bank Śląski

Bank address: ul. Zwycięstwa 28, 44-100 Gliwice, Poland

Account number/IBAN CODE: PL76105012981000002300809767

Swift code: INGBPLPW

Gliwice – Sao Paulo – Athens – Osaka – Doha – Worcester – Auckland – Szczecin – Singapore

© 2012 International OCSCO World Press.

All rights reserved.

## Reading Direct

This journal is a part of Reading Direct, the free of charge alerting service which sends tables of contents by e-mail for this journal and in the promotion period also the full texts of papers. You can register to Reading Direct at

<http://www.archivesmse.org>

© The paper used for this journal meets the requirements of acid-free paper.

Printed in Poland.

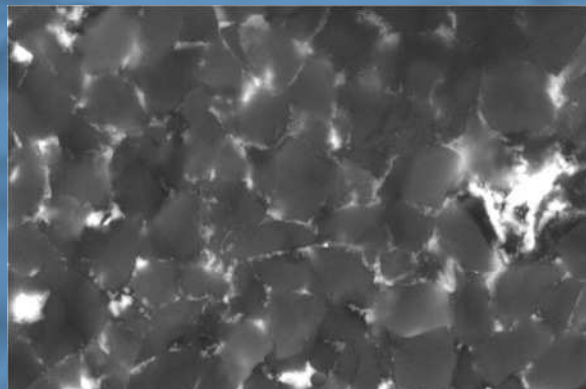
## Professor

Leszek A. Dobrzanski M Dr hc  
Editor-in-Chief of the AMSE  
President of the WAMME  
President of the ACMSSSE



Dear Readers,

The next issue of Archives of Materials Science and Engineering is handed over to PT Readers. As usual, we have tried to collect engaging scientific papers. We hope that they will be interesting for you. The 18<sup>th</sup> International Scientific Conference on the Contemporary Achievements in Mechanics, Manufacturing and Materials Science CAM3S'2012 will be organised on 27<sup>th</sup>-29<sup>th</sup> February 2012 in Gliwice – Ustroń, Poland by the World Academy of Materials and Manufacturing Engineering WAMME. In the Conference which will be accompanied by various other scientific events the participation of over 200 delegates is foreseen. Among others the International Conference Finalising FORSURF Project on "The foresight of surface properties formation leading technologies of engineering materials and biomaterials" co-founded by the European Union from financial resources of the European Regional Development Fund of the European Union and also the occasional sessions on Prof. Zbigniew Rdzawski's 70<sup>th</sup> anniversary of his birthday will take place. I wish the delegates of the Conference and the accompanying events the successful debates, and a nice reading to the Readers of the next issue and as always encourage PT Authors to publish their papers in next issues of our journal.



The paper written by M. Szutkowska, L. Jaworska, M. Rozmus, P. Klimczyk and M. Bucko on "Diamond composites with nanoceramic boride bonding phases" on a page 85 informs about basic mechanical properties of the studied tool composites and microstructure of diamond- titanium diboride composite, and diamond-titanium diboride-titanium nitride composite with participation of nanopowders. Composites were prepared on the basis of diamond powders of 3-6  $\mu\text{m}$  (MDA36, Element Six) and the  $\text{TIB}_2/\text{TIN}$  nanopowders of below 45 nm (Neomat Co. Lithuania firm) and nanopowder of  $\text{TIB}_2$  with size of crystallite below of 100 nm (American Elements firm). Different amount of a bonding phase changing in range from 10 to 30 wt% was used. Compacts in the shape of disc with dimension  $\phi 15 \times 5$  mm were sintered at pressure  $8.0 \pm 0.2$  GPa and temperature of 2235 K using the Bridgman type apparatus. Microstructure studies using scanning microscope, X-ray and electron diffraction phase analysis were used. In this work the effect of reduction powder size from submicron scale to nano scale of two ceramic bonding phases: titanium diboride and titanium diboride-nitride in diamond composites on selected mechanical properties has been reported. The results show that using of the  $\text{TIB}_2$  powders in nano scale size increases the Vicker's hardness about 30 wt% in comparison to the use of the  $\text{TIB}_2/\text{TIN}$  phase. The influence of the bonding phase amount on the tested properties was observed. Vicker's hardness  $HV1$  was changed in the range from 20,0 to 50,0 GPa, Young's modulus ( $E$ ) from 360 to 600 GPa and density ( $\rho$ ) from 3,30 to 3,63 g/cm<sup>3</sup>. The highest values of Vickers hardness and Young's modulus were obtained for diamond composites sintered with 10 wt%  $\text{TIB}_2$  of bonding phase. These investigations allow enhance possibility of using those materials as burnishing tools and rational use of existing ceramic tools.